

REMARKS

1. Objection to drawings under 37 CFR 1.83(a) for lacking reference numerals 10'' and 20'':

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Regarding the objection to the drawings under 37 CFR 1.83(a), the specification has been amended in paragraphs [0025] – [0028] to revise reference numerals 10'' and 20'' to 10' and 20' respectively. No new matter is introduced by these amendments. In support of this, Fig.5 clearly illustrates numeral 10' as indicating an HBT amplifier and numeral 20' as indicating backside vias. A clerical error in the electronic filing process is suspected of introducing these typographical errors into the specification. Consideration of these amendments to the specification is requested, and upon the examiner's acceptance of these amendments corrections to the drawings should no longer be required.

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2. Objection to the disclosure because of an informality on page 5, paragraph [0028], "amplifier 10,10" should be corrected to "amplifier 10,10"":

Regarding the informality in paragraph [0028] of the specification, "amplifier 10, 10" has been revised to --amplifier 10, 10'-- to agree with the drawings. This amendment corrects a typographical error, and no new matter is introduced. Consideration of this amendment to the specification is requested.

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3. Rejection of claims 1-3, 7, 8, 10-14, and 16 under U.S.C. 102(e) as being anticipated by Shirakawa, EP 1 077 494 A2:

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In EP 1 077 494 A2 (see Figs.1B, and 15-18), Shirakawa teaches an ohmic contact 4 connecting the emitter 1 to the metal wiring line 11, the ohmic contact 4 being formed of WN film or WN/Ti/Au multilayer film. Even if the metal wiring line 11 is regarded as an emitter electrode, the ohmic contact 4 is still required to connect the heat sink 12 and the emitter 1. In addition, as can be seen in Figs.2A-2E of EP 1 077 494 A2 illustrating the process taught by Shirakawa, the ohmic contact 4 is a

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necessary component, as the metal wiring line 11 cannot be directly connected to the emitter 1. Any attempt to simply remove the ohmic contact 4 from the process taught by Shirakawa would result in a device with undesired functionality. Thus, Shirakawa does not teach or suggest that the ohmic contact 4 is optional or that a direct
5 connection between the emitter 1 and the heat sink 12 is desirable or even possible.

In contrast to Shirakawa's teachings, the applicant's invention as recited in claim 1 includes the limitation of "an emitter electrode **directly** connecting the heat sink and the emitter". Referring to applicant's Fig.3 and Fig.4, the emitter electrodes (bump) 20
10 and (via) 20' are shown directly connected to the heat sink 22 thereby simplifying the manufacturing process. Shirakawa does not teach or suggest such a direct connection. Therefore, claim 1 includes a novel and unobvious limitation over Shirakawa in EP 1 077 494 A2.

15 Similarly, applicant's claim 13 also recites the limitation of "**directly** connecting the heat sink and the emitter using an emitter electrode". Claim 13 should therefore be patentable over Shirakawa in view of the above argument.

In addition, the current disposition of claim 7 is unclear, as claim 7 has been
20 indicated as both rejected under U.S.C. 102(e) referencing Shirakawa (EP 1 077 494 A2) and allowable but dependent on a rejected base claim.

Reconsideration of claims 1-3, 7, 8, 10-14, and 16 is hereby requested in view of the above argument. Claims 2, 3, 7, 8, 10-12, 14, and 16 are dependent on claims 1
25 and 13 and should be allowable if claims 1 and 13 are found allowable.

4. Rejection of claims 9 and 15 under 35 U.S.C. 103(a) as being unpatentable over Shirakawa in view of Alderstein et al., US 5,986,324:

30 Reconsideration of claims 9 and 15 is politely requested in view of the above arguments for claims 1 and 13. As claims 9 and 15 are dependent on claims 1 and 13 respectively, claims 9 and 15 should be allowed if claims 1 and 13 are found

allowable.

5. Rejection of claims 17-19 under 35 U.S.C. 102(e) as being anticipated by Sato, US 5,349,239:

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Claim 17 has been amended to recite the limitation of "a bump **directly** disposed on the emitter...". This limitation finds support in the specification in paragraph [0024] and Fig.3 for instance, and no new matter is entered. Referring to Fig.2 and Fig.3 of US 5,349,239, Sato teaches an emitter 5 connecting to a bump electrode 1 through a
10 Ti layer 2. Sato does not teach or suggest a direct connection between the emitter 5 and the bump electrode 1. Thus, the applicant contends that the present invention as claimed in the amended claim 17 teaches a direct connection limitation that is not taught or suggested by Sato in US 5,349,239.

15 Reconsideration of claims 17-19 is hereby requested in view of the above argument. Claims 18 and 19 are dependent on claim 17 and should be allowable if claim 17 is found allowable.

6. Rejection of claim 20 under 35 U.S.C. 102(e) as being anticipated by Sato, US
20 5,349,239 in view of Shirakawa, EP 1 077 494 A2:

Based on the wording of the rejection, this office believes that it should be under U.S.C. 103.

25 Regardless, reconsideration of claim 20 is politely requested in view of the above amendment to claim 17. As claim 20 is dependent on claims 17, claim 20 should be allowed if claim 17 is found allowable.

7. New claims 21-24:
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Claim 21 claims the enlarged portion of the emitter and the relative location of the flip-chip bump as disclosed in the specification in paragraph [0028] and Fig.1 and

Fig.3 for instance. No new matter is introduced by claim 21. None of the cited art teaches or suggests the limitations of claim 21 such as an "emitter including an enlarged portion located laterally away from the collector and the base" and "a flip-chip bump connecting the heat sink and the enlarged portion of the emitter". In addition, while Sato (US 5,349,239) discloses a bump, Sato does not teach or suggest an enlarged emitter or how to accommodate such with the bump.

Claim 22 further recites the flip-chip bump and the heat sink provide an electrical ground connection of the emitter. No new matter is introduced by claim 22.

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Claim 23 recites the limitations of an "emitter including an enlarged portion located laterally away from the collector and the base" and a "via penetrating the substrate at the location of the enlarged portion of the emitter" as supported by the via 20' and its location illustrated in Fig.4 and Fig.5 for instance. No new matter is entered by claim 23.

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Regarding claim 23, Shirakawa (EP 1 077 494 A2) teaches a via hole 10 cutting through the emitter 1, base 2, and collector 3 disturbing the transistor structure. Thus, Shirakawa requires the interlayer insulator 9 to achieve functional structure, however, the addition of the interlayer insulator 9 further complicates the manufacturing process. As shown in applicant's Fig.5, the via 20' does not cut through or otherwise interfere with the emitter 14a or 14b, the base 16, or the collector 12, and no such protective layer is required, which results in a simpler manufacturing process. All art cited by the examiner (EP 1 077 494 A2 to Shirakawa, US 5,986,324 to Alderstein et al., and US 5,349,239 to Sato) teach modifying the structure on the top surface of the base, the emitter, and the collector, resulting in additional complications in manufacture. The present invention as recited in the new claim 23 teaches an enlarged portion of an emitter located away from the collector and the base at the expense of device area, making it easier to form a via penetrating the substrate. This argument is also presented to further support the new claim 21.

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Claim 24 further recites the via and the heat sink provide an electrical ground

connection of the emitter. No new matter is introduced by claim 24.

Consideration of new claims 21-24 is respectfully requested.

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Sincerely,

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